50961 Chapter 10, said conversion layer having a layer thickness of about 100 nm to 1000 nm, said conversion layer having across the conversion layer thickness a chromium content of greater than 1% based upon zinc and chromium, said conversion layer having an average chromium content of more than approximately 5% based on zinc and chromium, said conversion layer having a chromium index greater than approximately 10, wherein the chromium index is defined as said average chromium content (chromium/(chromium + zinc)) in the layer greater than 1% Cr, multiplied by the layer thickness in nm.

2. ~~59.~~ A conversion layer according to claim ~~58~~ 1, wherein said conversion layer has a chromium-rich zone greater than approximately 20% chromium, based upon zinc and chromium in the conversion layer, of more than approximately 15 nm.

3. ~~60.~~ A conversion layer according to claim ~~58~~ 1, wherein said layer is transparent.

4. ~~61.~~ A conversion layer according to claim ~~58~~ 1, wherein said layer is clear.

5. ~~62.~~ A conversion layer according to claim ~~58~~ 1, wherein said layer is substantially colorless.

6. ~~63.~~ A conversion layer according to claim ~~58~~ 1, wherein said

layer is iridescent.

7. 64. A conversion layer according to claim 58, wherein said layer presents multi-colored iridescence.

8. 65. A conversion layer according to claim 58, wherein said layer is hard.

9. 66. A conversion layer according to claim 58, wherein said layer is resistant to wiping.

10. 67. A conversion layer according to claim 58, wherein said layer adheres well.

11. 68. A conversion layer according to claim 58, wherein said layer contains, for further enhanced corrosion protection, one or more components selected from the group consisting of silicate, cerium, aluminum and borate.

12. 69. A conversion layer according to claim 58, wherein said layer further comprises cobalt.

13. 70. A conversion layer according to claim 58, wherein said layer further comprises one or more metal compounds selected from the group consisting of 1- to 6-valent metal compounds.

14. ~~71.~~ A conversion layer according to claim ~~58~~ 1, wherein said layer further comprises one or more metal compounds selected from the group consisting of Na, Ag, Al, Co, Ni, Fe, Ga, In, Lanthanides, Zr, Sc, Ti, V, Cr, Mn, Cu, Zn, Y, Nb, Mo, Hf, Ta and W.

15. ~~72.~~ A conversion layer according to claim ~~58~~ 1, wherein said layer further comprises one or more ions selected from the group consisting of anions.

16. ~~73.~~ A conversion layer according to claim ~~58~~ 1, wherein said layer further comprises one or more ions selected from the group consisting of halide ions, sulfurous ions, nitrate ions, ~~phosphoric ions~~ phosphorus-containing ions, carboxylic acid anions and silicon-containing anions.

17. ~~74.~~ A conversion layer according to claim ~~58~~ 1, wherein said layer further comprises one or more ions selected from the group consisting of chloride ions, sulfate ions, phosphate ions, diphosphate ions, linear and cyclic oligophosphate ions, linear and cyclic polyphosphate ions, hydrogen phosphate ions, and silicate anions.

18. ~~75.~~ A conversion layer according to claim ~~58~~ 1, wherein said layer further comprises one or more materials selected from the group consisting of polymers, corrosion inhibitors, silicic

acids, surfactants, polyols, organic acids, amines, plastics dispersions, dyes, pigments, chromogenic agents, amino acids, siccatives, and dispersing agents.

19 ~~76~~. A conversion layer according to claim ~~58~~ 17, wherein said layer further comprises one or more materials selected from the group consisting of organic polymers, colloidal or disperse silicic acids, diols, triols, monocarboxylic acids, carbon black, metal chromogenic agents, glycin, and cobalt siccatives.

20 ~~77~~. A conversion layer according to claim ~~58~~ 17, wherein said layer further comprises one or more materials selected from the group consisting of dyes and color pigments.

21 ~~78~~. A method for producing a chromium(VI)-free conversion layer affording at least the corrosion protection of conventional chromium(VI)-containing yellow chromations, said method comprising the step of treating a metallic surface with a solution of at least one chromium(III) complex and at least one salt, wherein chromium(III) is present in said solution in a concentration of approx. 5 to 100 g/l; and said chromium(III) complex has ligand replacement kinetics more rapid than the fluoride replacement kinetics in chromium(III)-fluorocomplexes, said method producing a chromium(VI)-free conversion layer affording at least the corrosion protection of conventional chromium(VI)-containing yellow chromations.

22 ~~79~~. A method according to claim 21, wherein said metallic surface is zinc or zinc alloy.

23 ~~80~~. A method according to claim 21, wherein said metallic surface is zinc or zinc alloy with iron.

24 ~~81~~. A method according to claim 21, wherein said treating is carried out at an elevated temperature.

25 ~~82~~. A method according to claim 21, wherein said treating is carried out at a temperature of 20 to 100°C.

26 ~~83~~. A method according to claim 21, wherein said treating is carried out at a temperature of 20 to 80°C.

27 ~~84~~. A method according to claim 21, wherein said treating is carried out at a temperature of 30 to 60°C.

28 ~~85~~. A method according to claim 21, wherein said treating is carried out at a temperature of 40 to 60°C.

29 ~~86~~. A method according to claim 21, wherein said chromium(III) complex has chelate ligands which are selected from the group consisting of dicarboxylic acids, tricarboxylic acids, hydroxycarboxylic acids, acetylacetone, urea, urea derivatives,

mixtures thereof, among each other as well as in mixed complexes with inorganic anions and H_2O.

30. 87. A method according to claim 21, wherein said chromium(III) complex has chelate ligands which are selected from the group consisting of oxalic, malonic, succinic, glutaric, adipic, pimelic, suberic, azelaic and sebacic acids, mixtures thereof, and in mixed complexes with inorganic anions and H_2O.

31. 88. A method according to claim 21, wherein said chromium(III) complex has chelate ligands which are selected from the group consisting of maleic acid, phthalic acid, terephthalic acid, tartaric acid, citric acid, malic acid, ascorbic acid, mixtures thereof, and in mixed complexes with inorganic anions and H_2O.

32. 89. A method according to claim 21, wherein said chromium(III) complex has chelate ligands which are selected from the group consisting of malonic acid and malonic acid in mixed complexes with inorganic anions and H_2O.

33. 90. A method according to claim 21, wherein said method is performed repeatedly on said metallic surface.

34. 91. A method according to claim 21, wherein said treating is carried out at a temperature of 20 to 100°C with rinsing water

recycling over at least 2 cascaded rinsing stages.

35 ~~92.~~ A method according to claim ~~91~~ 34, wherein a blue chromation is performed in one of the rinsing stages.

36 ~~93.~~ A method according to claim ~~78~~ 12, wherein said method includes an immersion period of between approx. 15 and 200 seconds.

37 ~~94.~~ A method according to claim ~~78~~ 12, wherein said method includes an immersion period of between approx. 15 and 100 seconds.

D cont'd

38 ~~95.~~ A method according to claim ~~78~~ 12, wherein said method includes an immersion period of approx. 30 seconds.

39 ~~96.~~ A passivation bath for passivating a metal surface, said bath comprising chromium(III) in a concentration of approx. 5 to 100 g/l, chromium(III) being present in said bath in the form of at least one chromium(III) complex having ligand replacement kinetics more rapid than the fluoride replacement kinetics in chromium(III)-fluorocomplexes, said bath substantially containing chromium(III) as a passivating component.

40 ~~97.~~ A passivation bath according to claim ~~96~~ 39, wherein said

metal surface is zinc or zinc alloy.

41. ~~98.~~ A passivation bath according to claim 39, wherein said chromium(III) complex is selected from complexes with chromium(III) and at least one chelate ligand selected from the group consisting of dicarboxylic acids, tricarboxylic acids, hydroxycarboxylic acids, acetylacetone, urea, urea derivatives, mixtures thereof, among each other as well as in mixed complexes with inorganic anions and H_2O.

42. ~~99.~~ A passivation bath according to claim 39, wherein said chromium(III) complex is selected from complexes with chromium(III) and at least one chelate ligand selected from the group consisting of oxalic, malonic, succinic, glutaric, adipic, pimelic, suberic, azelaic and sebacic acids, mixtures thereof, and in mixed complexes with inorganic anions and H_2O.

43. ~~100.~~ A passivation bath according to claim 39, wherein said chromium(III) complex is selected from complexes with chromium(III) and at least one chelate ligand selected from the group consisting of maleic acid, phthalic acid, terephthalic acid, tartaric acid, citric acid, malic acid, ascorbic acid, mixtures thereof, and in mixed complexes with inorganic anions and H_2O.

44. ~~101.~~ A passivation bath according to claim 39, wherein said

chromium(III) complex is selected from complexes with chromium(III) and at least one chelate ligand selected from the group consisting of malonic acid and malonic acid in mixed complexes with inorganic anions and H_2O.

45 ~~102~~. A passivation bath according to claim 39 ~~96~~, wherein said bath further comprises one or more components selected from the group consisting of sealers, dewatering fluids, additional metal compounds, anions, polymers, corrosion inhibitors, silicic acids, surfactants, polyols, organic acids, amines, plastics dispersions, dyes, pigments, chromogenic agents, amino acids, siccatives and dispersing agents.

D 10 of 14

46. ~~103~~. A passivation bath according to claim 39 ~~96~~, wherein said bath further comprises one or more components selected from the group consisting of 1- to 6-valent metal compounds, halide ions, sulfurous ions, nitrate ions, phosphoric ions, carboxylic acid anions, silicon-containing anions, organic polymers, colloidal or disperse silicilic acids, diols, triols, monocarboxylic acids, carbon black, metallic chromogenic agents, glycin, and cobalt siccatives.

47. ~~104~~. A passivation bath according to claim 39 ~~96~~, wherein said bath further comprises one or more components selected from the group consisting of metal compounds of Na, Ag, Al, Co, Ni, Fe, Ga, In, Lanthanides, Zr, Sc, Ti, V, Mn, Cu, Zn, Y, Nb, Mo, Hf, Ta

and W, chloride ions, sulfate ions, phosphate ions, diphosphate ions, linear and cyclic oligophosphate ions, linear and cyclic polyphosphate ions, hydrogen phosphate ions and silicate anions.

48 ~~105~~. A passivation bath according to claim 39 ~~96~~, wherein chromium(III) is present in a concentration of approx. 5 g/l to 80 g/l.

49 ~~106~~. A passivation bath according to claim 39 ~~96~~, wherein chromium(III) is present in a concentration of approx. 5 g/l to 60 g/l.

D/cont'd

50 ~~107~~. A passivation bath according to claim 39 ~~96~~, wherein chromium(III) is present in a concentration of approx. 10 g/l to 30 g/l.

51 ~~108~~. A passivation bath according to claim 39 ~~96~~, wherein chromium(III) is present in a concentration of approx. 20 g/l.

52 ~~109~~. A passivation bath according to claim 39 ~~96~~, wherein said bath has a pH between approx. 1.5 and 3.

53 ~~110~~. A passivation bath according to claim 39 ~~96~~, wherein said bath contains approx. 20 g/l chromium(III) and has a pH of approx. 2 to 2.5.

54 ~~111.~~ A passivation bath according to claim 39, wherein said bath has a bath temperature of approx. 20 to 100°C.

55 ~~112.~~ A passivation bath according to claim 39, wherein said bath has a bath temperature of approx. 20 to 80°C.

56 ~~113.~~ A passivation bath according to claim 39, wherein said bath has a bath temperature of approx. 30 to 60°C.

57 ~~114.~~ A passivation bath according to claim 39, wherein said bath has a bath temperature of approx. 40 to 60°C.

D/cont'd

58 ~~115.~~ A concentrate for producing a passivation solution for passivating a metal surface, said concentrate substantially containing chromium(III) for a passivating component, wherein said chromium(III) is present in the form of at least one complex having ligand replacement kinetics more rapid than the fluoride replacement kinetics in chromium(III)-fluorocomplexes.

59 ~~116.~~ A concentrate according to claim 58, wherein said concentrate is present in liquid form.

60 ~~117.~~ A concentrate according to claim 58, wherein said concentrate is present in solid form.

61 ~~118.~~ A concentrate according to claim 58, wherein said

D